Carbohydrate Nomenclature

"Abandon all hope ye who enter here."

The Divine Comedy, Dante Alighieri (1265-1321)

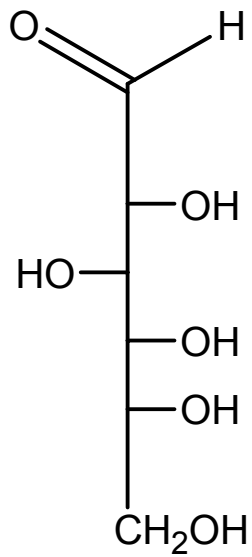
Monosaccharides

Length of carbon chain:

C4 – tetrose; erythrose, threose (rare)
C5 – pentose; ribose *etc.* (common)
C6 – hexose; glucose *etc.* (common)
C7 – heptose; D-*glycero*-L-*manno*-heptose (LPS)
…

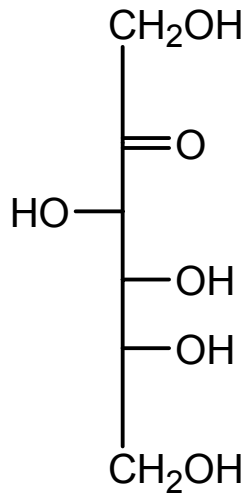
Functional groups

aldose
hex*ose*



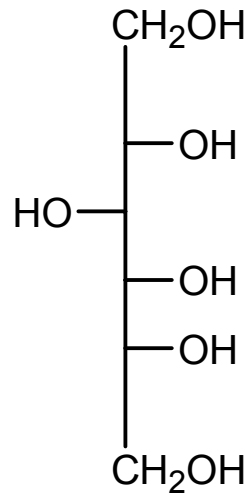
D-gluc*ose*

ketose
hex*ulose*



D-*arabino*-hex*ulose*
(D-fructose)

alditol
hex*itol*



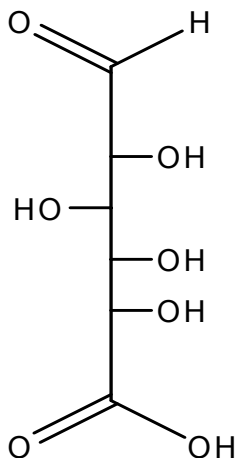
D-gluc*itol*
(sorbitol)

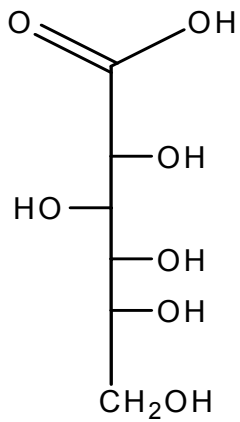
Carboxylic acids

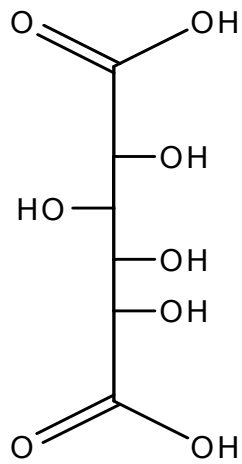
uronic acid
hex*uronic acid*

aldonic acid
hexonic acid

aldaric acid
hexaric acid



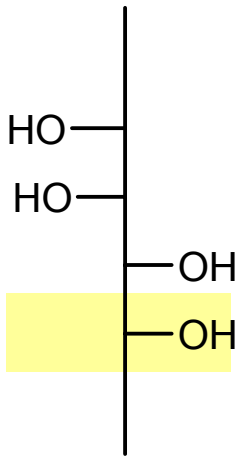




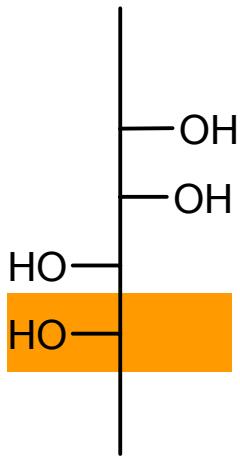
D-gluc*uronic acid* D-gluc*onic acid* D-gluc*aric acid*

Configuration

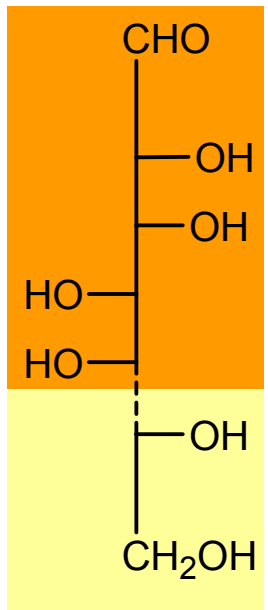
D-*manno*-



L-*manno*-

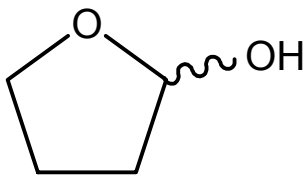


D-*glycero*-L-*manno*-heptose

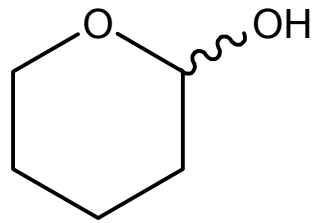


Ring size

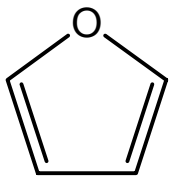
furanose



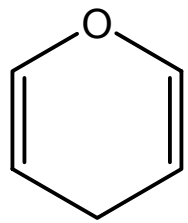
pyranose



furan

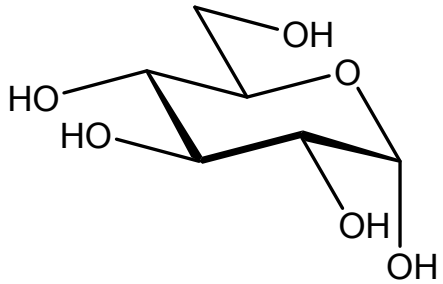


4H-pyran

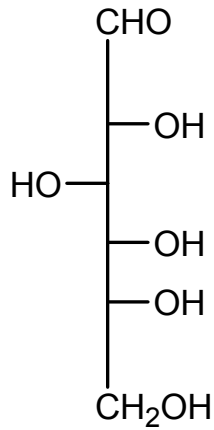


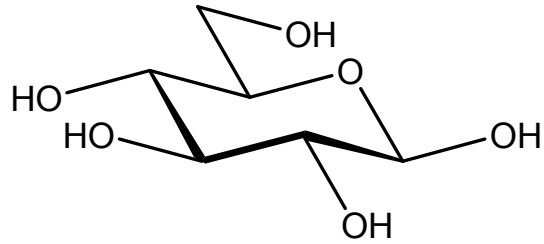
Anomeric configuration

ring formation gives rise to an additional stereo-centre

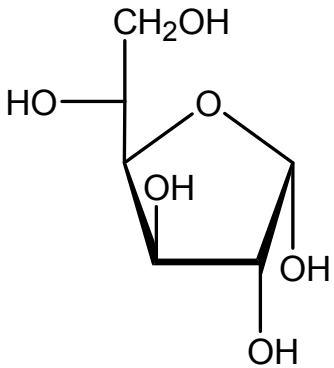


α-D-glucopyranose

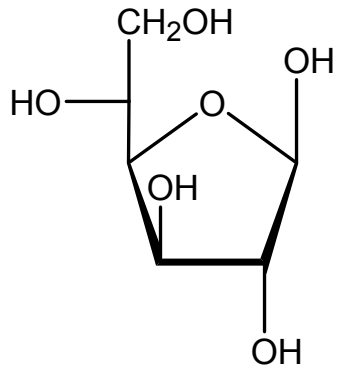




β-D-glucopyranose



α-D-glucofuranose



β-D-glucofuranose

Anomeric configuration

2-Carb-6.2. The anomeric reference atom and the anomeric configurational symbol (α or β)
In the α anomer, the exocyclic oxygen atom at the anomeric centre is formally *cis*, in the Fischer projection, to the oxygen attached to the anomeric reference atom; in the β anomer these oxygen atoms are formally *trans.*

...any questions?

How to…

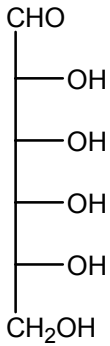
Look at the Fischer projection and find the ‘reference atom’

Check if the group next to the anomeric center is *cis* or *trans* relative to the reference

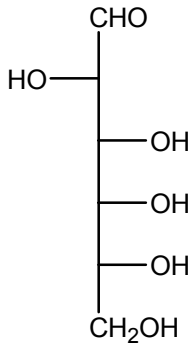
Use this atom as your new reference

If your new reference has the same relation to the substituent at the anomeric centre the anomeric configuration is α otherwise it is β.

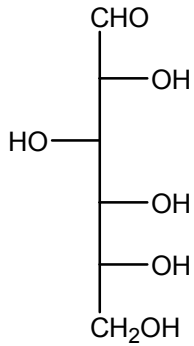
All altruists gladly make gum in gallon tanks



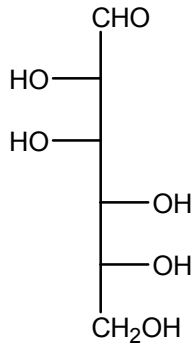
allose



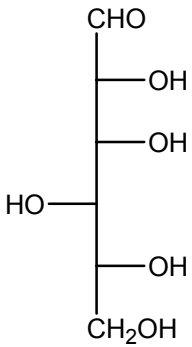
altrose



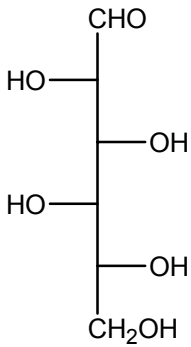
glucose



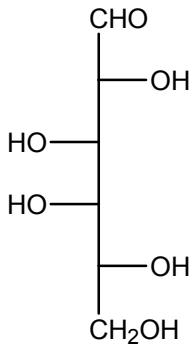
mannose



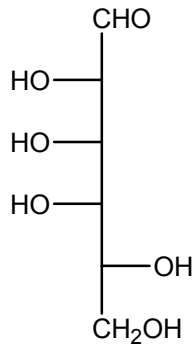
gulose



idose



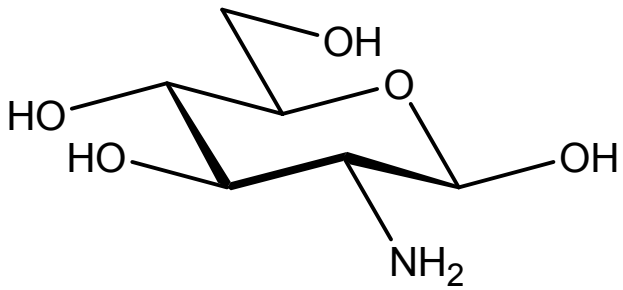
galactose



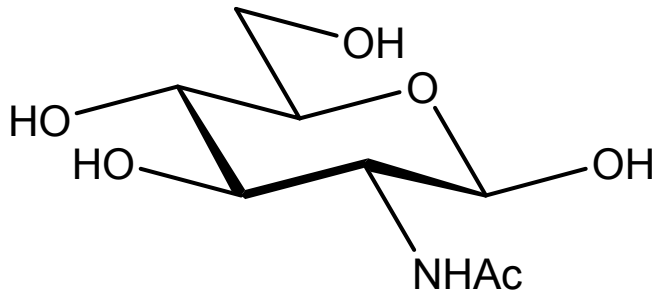
talose

Graduate course in
Carbohydrate Chemistry

Aminosugars

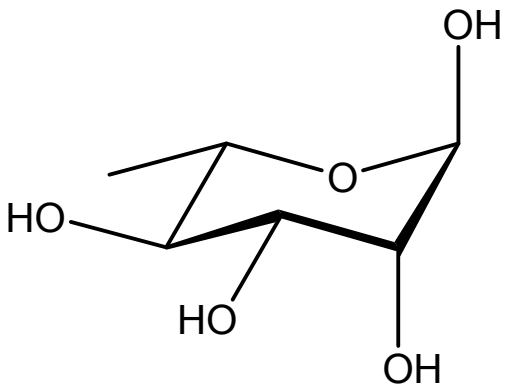


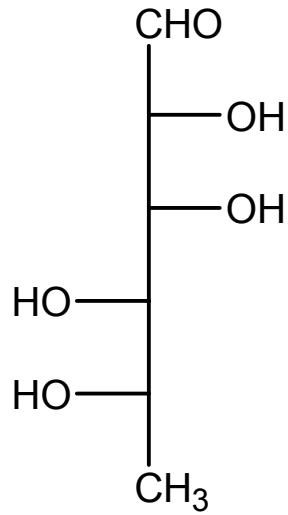
2-amino-2-deoxy-glucose
"glucosamine"



2-acetamido-2-deoxy-glucose
"*N*-acetyl-glucosamine"

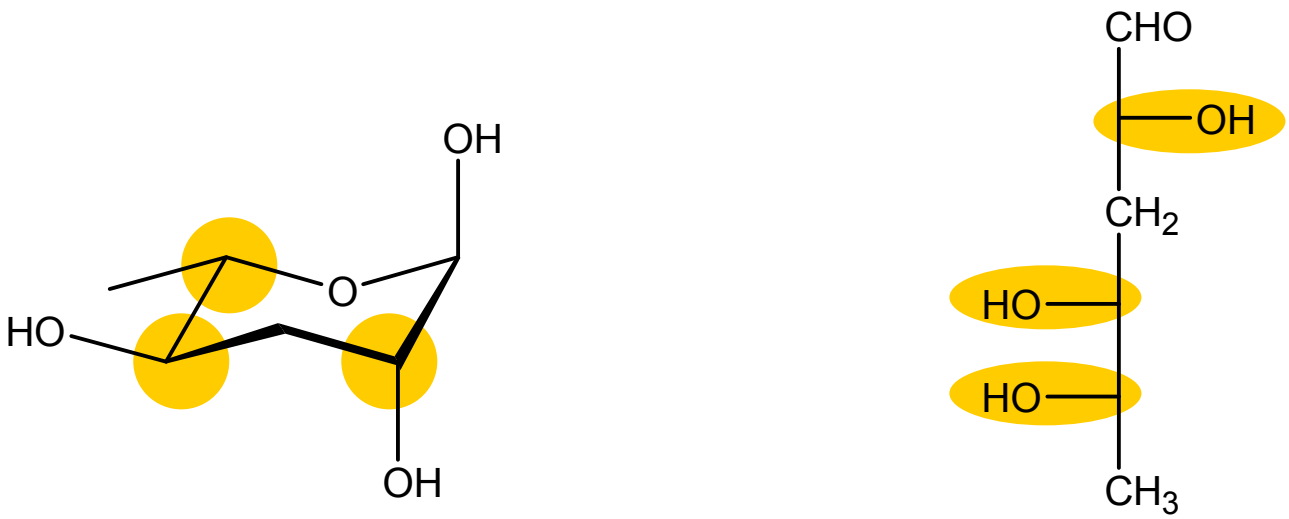
Deoxysugars





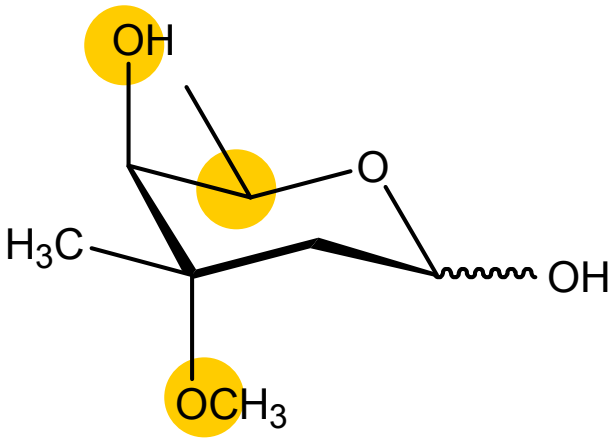
6-deoxy-α-L-mannopyranose
"L-rhamnopyranose"

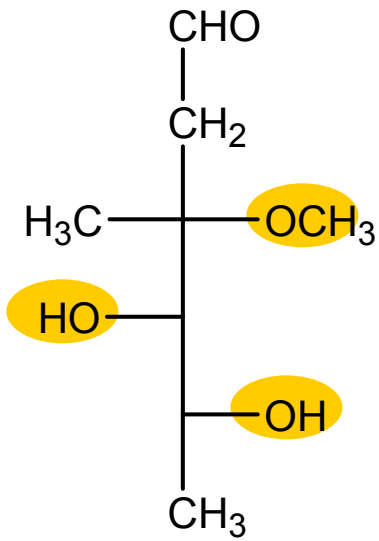
Reducing the number of stereo-centres



3,6-dideoxy-α-L-*arabino*-hexose
"ascarylose"

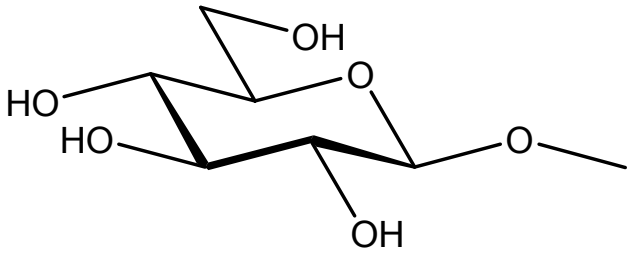
Substitution



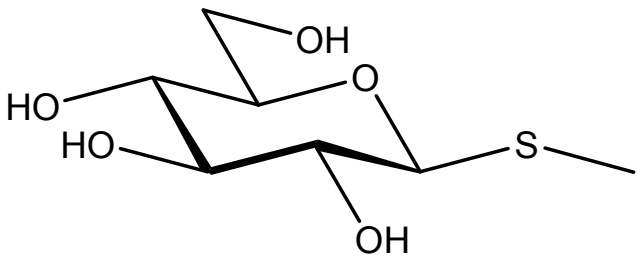


2,6-dideoxy-3-*C*-methyl-3-*O*-methyl-*xylo*-hexose
"arcanose"

O- & *S*-Glycosides

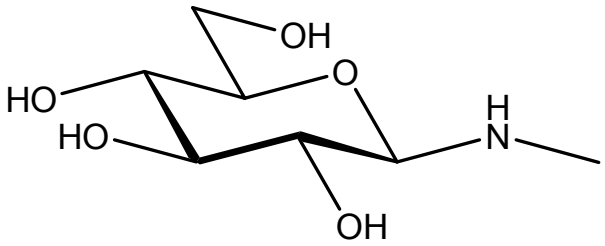


Methyl β-D-glucopyranos*ide*

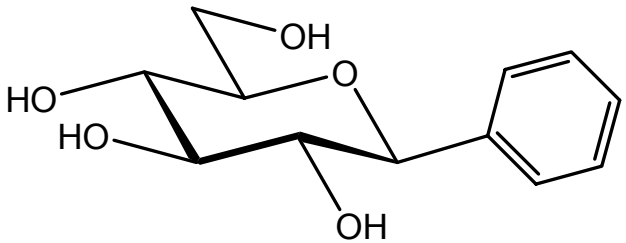


Methyl *1-thio*-β-D-glucopyranos*ide*

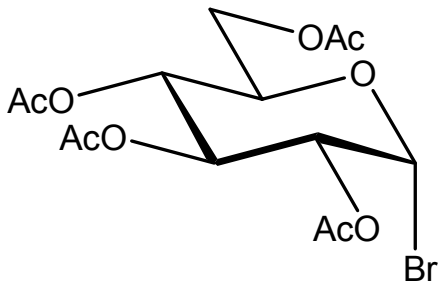
N- and *C*-glycosides



N-methyl glucopyran*osylamine*

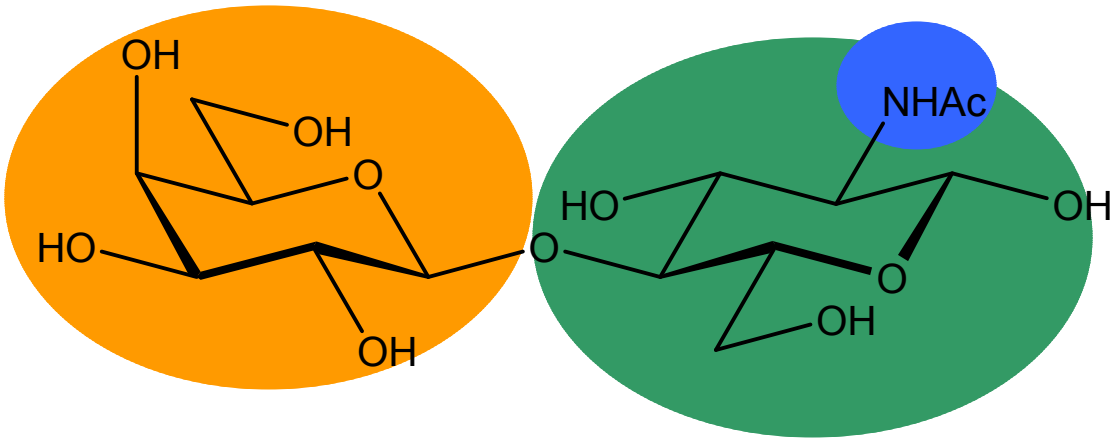


glucopyranosylbenzene



tetra-*O*-acetyl-α-D-glucopyran*osyl bromide*
"acetobromoglucose"

Disaccharides



2-acetamido-2-deoxy-4-*O*-(β-D-galactopyranosyl)-β-D-glucopyranose

"*N*-acetyl lactosamine"

β-D-Gal*p*-(1→4)-β-D-Glc*p*NAc

Symbols

Glucose	Glc
Glucosamine	GlcN
Glucuronic acid	GlcA
Galactose	Gal
Mannose	Man
Rhamnose (6-deoxymannose)	Rha
Fucose (6-deoxygalactose)	Fuc

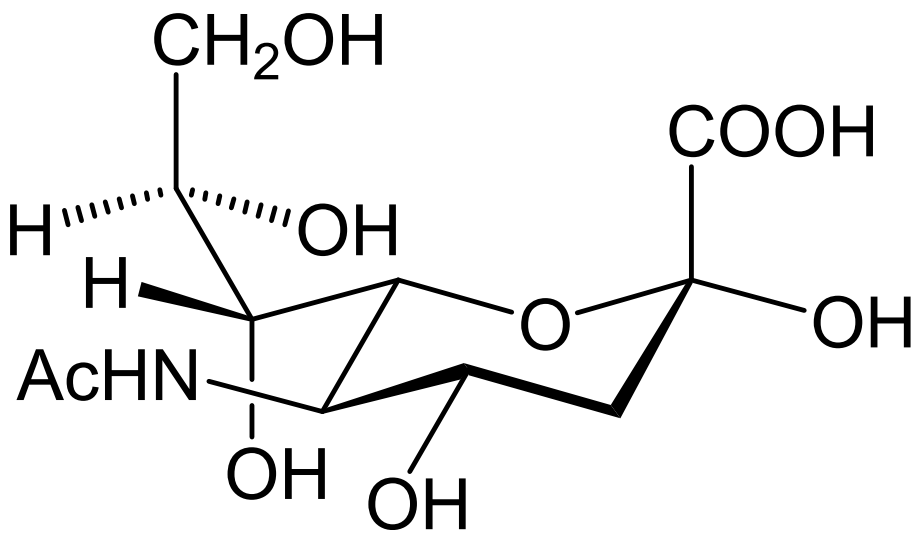
Polysaccharides

[4)-α-D-Glc*p*-(1→] (1→4)-α-D-Glucopyranan (amylose)

[4)-β-D-Glc*p*-(1→] (1→4)-β-D-Glucopyranan (cellulose)

Amylose and cellulose are glucans

Sialic acids



N-acetyl-neuraminic acid, α-Neu5Ac
5-acetamido-3,5-dideoxy-D-*glycero*-α-D-*galacto*-nonulopyranosonic acid

Reference

IUPAC-IUBMB nomenclature:

http://www.chem.qmul.ac.uk/iupac

- Carbohydrate nomenclature (1996)
- Glycolipid nomenclature (1997)
- Glycopeptide nomenclature (1985)
- Cyclitol (inositol) nomenclature (1973)

“Though this be madness, yet there is a method in't.”
Hamlet, Prince of Denmark, William Shakespear (1564-1616)